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Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Florida)

SNOOK

Fish and Wildlife Service
U.S. Department of the Interior

Coastal Ecology Group
Waterways Experiment Station
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by

William Seaman, Jr.
Sea Grant and School of Forest Resources and Conservation
and
Mark Collins
Department of Zoology
University of Florida
Gainesville, FL 32611

Project Manager
Larry Shanks
Project Officer
Norman Benson
National Coastal Ecosystems Team
U.S. Fish and Wildlife Service
1010 Gause Boulevard
Slidell, LA 70458

Performed for
Coastal Ecology Group
Waterways Experiment Station
U.S. Army Corps of Engineers
Vicksburg, MS 39180

and

National Coastal Ecosystems Team
Division of Biological Services
Research and Development
Fish and Wildlife Service
U.S. Department of the Interior
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PREFACE

This species profile is one of a series on coastal aquatic organisms, principally fish, of sport, commercial, or ecological importance. The profiles are designed to provide coastal managers, engineers, and biologists with a brief comprehensive sketch of the biological characteristics and environmental requirements of the species and to describe how populations of the species may be expected to react to environmental changes caused by coastal development. Each profile has sections on taxonomy, life history, ecological role, environmental requirements, and economic importance, if applicable. A three-ring binder is used for this series so that new profiles can be added as they are prepared. This project is jointly planned and financed by the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service.

Suggestions or questions regarding this report should be directed to:

Information Transfer Specialist
National Coastal Ecosystems Team
U.S. Fish and Wildlife Service
NASA-Slidell Computer Complex
1010 Gause Boulevard
Slidell, LA 70458

or

U.S. Army Engineer Waterways Experiment Station
Attention: WESER
Post Office Box 631
Vicksburg, MS 39180

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CONVERSION FACTORS

Metric to U.S. Customary

Multiply	By	To Obtain
millimeters (mm)	0.03937	inches
centimeters (cm)	0.3937	inches
meters (m)	3.281	feet
kilometers (km)	0.6214	miles
square meters (m^2)	10.76	square feet
square kilometers (km^2)	0.3861	square miles
hectares (ha)	2.471	acres
liters (l)	0.2642	gallons
cubic meters (m^3)	35.31	cubic feet
cubic meters	0.0008110	acre-feet
milligrams (mg)	0.00003527	ounces
grams (g)	0.03527	ounces
kilograms (kg)	2.205	pounds
metric tons (mt)	2205.0	pounds
metric tons	1.102	short tons
kilocalories (kcal)	3.968	BTU
Celsius degrees	1.8(C°) + 32	Fahrenheit degrees

U.S. Customary to Metric

inches	25.40	millimeters
inches	2.54	centimeters
feet (ft)	0.3048	meters
fathoms	1.829	meters
miles (mi)	1.609	kilometers
nautical miles (nmi)	1.852	kilometers
square feet (ft^2)	0.0929	square meters
acres	0.4047	hectares
square miles (mi^2)	2.590	square kilometers
gallons (gal)	3.785	liters
cubic feet (ft^3)	0.02831	cubic meters
acre-feet	1233.0	cubic meters
ounces (oz)	28.35	grams
pounds (lb)	0.4536	kilograms
short tons (ton)	0.9072	metric tons
BTU	0.2520	kilocalories
Fahrenheit degrees	0.5556(F° - 32)	Celsius degrees

ACKNOWLEDGMENTS

We are grateful for the reviews by Gerard Burger, Florida Department of Natural Resources, Grant Gilmore, Harbor Branch Foundation, Fort Pierce, Florida, and by Paul Shafland, Florida Game and Fresh Water Fish Commission, Boca Raton, Florida.

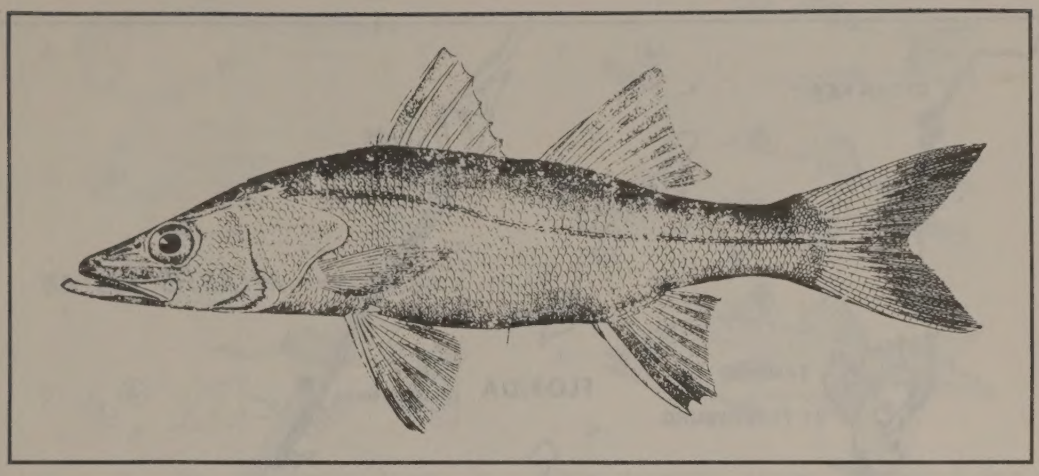

Figure 1. Snook.

SNOOK

NOMENCLATURE/TAXONOMY/RANGE

Scientific name . . . . . Centropomus undecimalis (Bloch)
Preferred common name . . . . . .Snook (Figure 1)
Other common names . . . . . .Robalo, thin snook
Class . . . . . Osteichthyes
Order . . . . . .Perciformes
Family. . . . . .Centropomidae

Geographic range: Coastal waters of the tropical and subtropical western Atlantic Ocean, from the U.S. mid-Atlantic to southeastern Brazil, including the insular and mainland margins of the Gulf of Mexico and Caribbean Sea. In the U.S. its center of abundance is the brackish coasts of south Florida (Figure 2), with a range extending from coastal Texas possibly as far as Delaware (Burgess 1980). Outside Florida, the only other permanent population in the United States is in Texas.

MORPHOLOGY/IDENTIFICATION AIDS

The snook is an elongate fish of up to 140 cm fork length (FL) and may weigh as much as 22 kg. It is easily distinguished by its dark lateral band and prominent protruding lower jaw. Larval and juvenile stages are illustrated in Figure 3 (Lau and Shafland 1982).

First dorsal fin with eight spines, separated from second dorsal fin of one spine and 10 soft rays. Anal fin with three spines, six soft rays. Pectoral rays 15 or 16. Lateral scales 70-77. Gill rakers on lower limb of first gill arch 7-9.

Body robust, sides little compressed. Silvery body color is shaded olive green. Maxillary reaches to or beyond center of eye. Pelvic fin does not extend to the anus in fish larger than 100 mm standard length (SL).

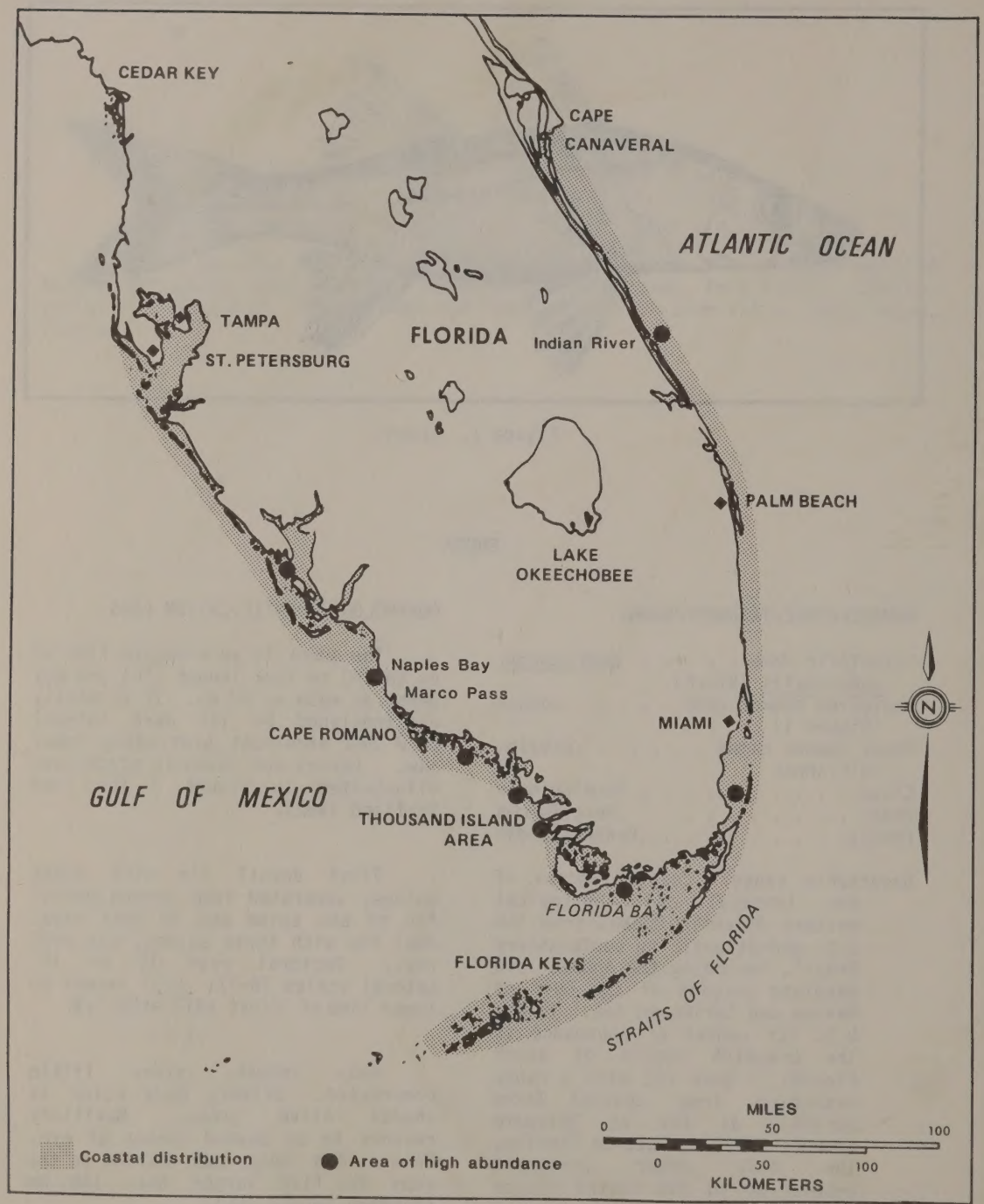

Figure 2. Distribution of snook (Centropomus undecimalis) in southern Florida.

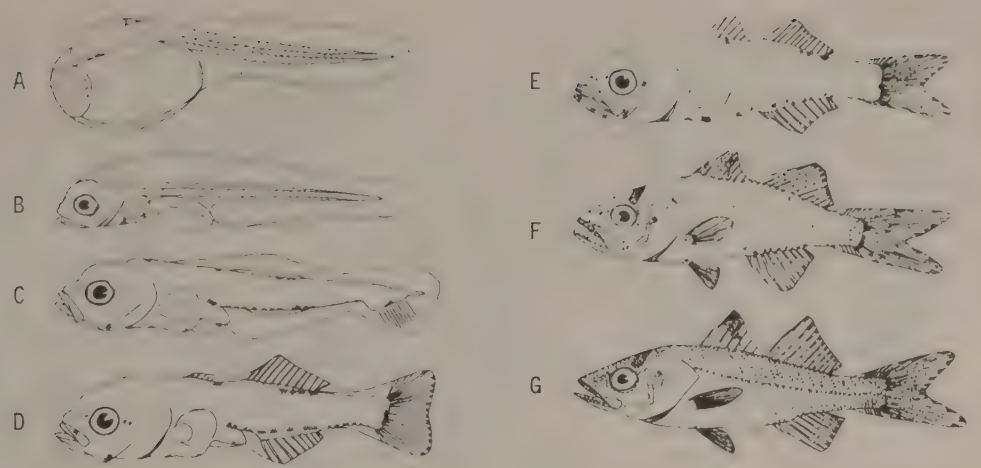

Figure 3. Representative larvae and early juvenile stages of Centropomus undecimalis (selected from Lau and Shafland 1982). All lengths in mm, SL: A, 1.5; B, 2.1; C, 3.8; D, 4.6; E, 6.3; F, 12.5; G, 21.9.

Table 1. Comparison of the Florida species of Centropomus.

Species	Meristic counts[a]		Florida range
	Lateral scales	Gill rakers	
C. ensiferus	53-60	13-16	Coastal, Miami area
C. parallelus	80-90	10-13	L. Okeechobee, and south on both sea coasts
C. pectinatus	62-70	15-18	Coastal, Indian River to Caloosahatchee River; (specimens from Panama City)
C. undecimalis	70-77	7-9	Coastal, Statewide

[a]Defined by Rivas (1962): Lateral scales are counted along the longitudinal row immediately above the lateral line, from the post-temporal (supraclavicle) to the caudal base. Gill rakers are counted along the lower limb of the first arch, including gill raker at angle but not the rudiments.

Comparison with Related Species

Rivas (1949,- 1962) recognized four species of Centropomus in Florida waters, whereas prior to 1949 all snook were referred to as C. undecimalis. This species is the most common and ubiquitous of the four; the other three are less abundant and are normally restricted to south Florida (Table 1). Comparisons by Rivas (1962) include drawings and an identification key. U.S. range maps for each species are plotted in Burgess (1980).

A fifth Atlantic species is discussed by Greenfield (1975), who provided a key. The comparative osteology of all Atlantic species is described by Fraser (1968).

REASON FOR INCLUSION IN SERIES

Snook is a renowned gamefish in Florida, particularly along the lower gulf coast. A commercial fishery existed until 1957. Snook inhabit both fresh- and saltwater but are most abundant in brackish estuaries, particularly mangrove-fringed bays and tidal streams. It is a carnivorous species at the top of the food web. Populations of the species have been declining as a result of fishing pressure and deterioration of habitat.

LIFE HISTORY

The snook's life cycle is depicted in Figure 4.

Spawning

The first recorded account of the capture of male and female snook extruding milt and eggs was in 1956 by Volpe (1959). These snook were taken from groups that "could be seen lying in shallow water just off the sandy beaches in the mouths of various saline open water passes" of southern Florida's gulf coast during June and July (Volpe 1959). Marshall (1958) examined snook gonads over several months and concluded that spawning probably began in May and may have continued to mid-November, although the bulk of spawning most likely occurred in May and June. Marshall also suggested that the fish may not eject all spawn at once. By assuming that the collection sites of gravid snook were spawning locations, Marshall (1958) proposed that snook congregate for spawning around the mouths of rivers, canals, and passes, and along adjacent shorelines. This agrees with conclusions of Volpe (1959) and Bruger (in prep).

Gilmore et al. (1983), using juvenile recruitment patterns to indicate spawning activity of snook on Florida's central east coast, found some differences from west coast spawning observations. Spawning activity is more prolonged on the east coast, beginning in April and continuing into December. In addition, there are two spawning peaks, one in June-July and another from August to October. Subsequent field work has established the peak of spawning to be in August, according to R. G. Gilmore (Harbor Branch Foundation, Ft. Pierce, Florida; pers. comm.) who has observed large schools of gravid adults. These differences may be associated with differing hydrological regimes between the east and west coasts.

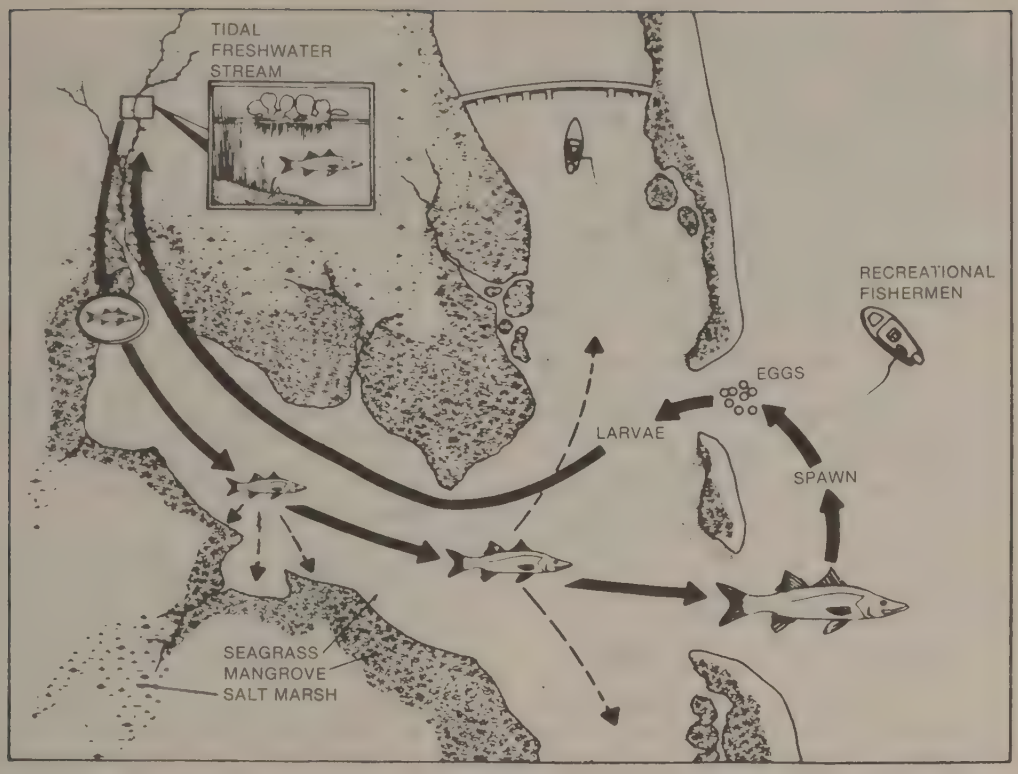

Figure 4. Snook life cycle. (Used with permission of R. Lewis, Mangrove Systems Inc., Tampa, Florida.)

Fecundity and Eggs

Volpe (1959) estimated a 58.4-cm FL female snook to contain 1,440,000 eggs. This corresponds well to an estimate of 1,648,000 eggs for a 79.5-cm specimen from Haiti (Beebe and Tee-Van 1928).

Lau and Shafland (1982) described advanced embryos of laboratory-reared snook. The embryos averaged 0.70 mm in diameter (range 0.68 to 0.73 mm). The yolk averaged 91% of the egg diameter, and a single oil globule averaging 0.12 mm was located in the ventral part of the yolk. The embryos had a lateral row and three vertical bands of small melanophores on the trunk.

Larvae

Using laboratory-reared and wild-caught material, Lau and Shafland (1982) described snook

larval development. Newly hatched larvae were 1.4-1.5 mm SL and increased to 2.1 mm within 36 h of hatching. A large oil globule was located beneath the head. By 48 h after hatching the eyes became pigmented, the mouth functioned, the yolk sac was absorbed, and the gut increased in diameter and became partitioned. At about 4 days of age the swim bladder was visible and the oil globule was completely absorbed.

By the time young snook reached 26 mm SL they resembled miniature adults (Figure 3). In a comparison of laboratory-reared snook to field-caught specimens, Lau and Shafland (1982) found no difference in body shape or pigmentation. Laboratory-reared specimens, however, exhibited meristic variation in vertebrae and fin ray numbers not observed in those from the wild.

Juveniles

On Florida's west coast, Fore and Schmidt (1973) searched numerous aquatic habitats (e.g., outer beaches, open bays, freshwater) in the Ten Thousand Islands area before locating juvenile snook. These nursery areas were brackish, shallow, warm tidal streams and dredged canals characterized by slow currents and soft mud bottoms with little submergent vegetation, but often with shoreline stands of red or white mangrove trees.

On the east coast of Florida, Gilmore et al. (1983) found that juvenile snook use at least three distinct habitats during their first year of life: freshwater tributaries, salt marsh, and seagrass beds. Snook averaging 27.5 mm SL are found in freshwater tributaries, arriving when at a length of about 11 mm and most leaving when 40-60 mm SL. Snook in the salt marsh average 67 mm SL, stay for 60 to 90 days, and leave at lengths of about 100 mm. Juvenile snook then enter seagrass beds and reside in the habitat for about 4 months. Upon reaching a length of approximately 300 mm, maturation begins and snook migrate from the seagrass beds. On Florida's west coast Fore and Schmidt (1973) collected juvenile snook of 14 to 196 mm SL from waters with salinities of 0.3 to 29.7 parts per thousand (ppt), and found no correlation between salinity and fish length. They concluded only that juveniles are usually found in brackish waters in that area.

Linton and Rickards (1965) encountered juvenile snook in the headward regions of several tidal creeks in the salt marsh at Sapelo Island, Georgia, during summer and early autumn. These juveniles are believed to have been carried north to the area by some combination of larval drift and hurricane-induced currents, and to have then made their way as far up the tidal creeks as possible to the same "nursery" grounds used by many other fishes.

Juveniles do not move to the high salinity spawning area with adults during the summer or fall. Rather, they remain in peripheral fresh and estuarine waters for at least the first year. Whether juvenile snook are strong schoolers has not been reported.

Adults

Adult snook are found dispersed through various freshwater and brackish habitats from winter to

spring. At this time, densities are low in many areas and fishermen may not specifically seek them. On the gulf coast, fishing pressure is traditionally high in summer, due to the congregation of fishes at and near spawning sites. In fact, 45% of the snook captured during the year in the Naples/Marco Island area are caught during the months of June and July only (Florida Saltwater Fisheries Study and Advisory Council 1982; Bruger in prep). On the east coast, however, R. G. Gilmore (pers. comm.) has observed large concentrations of snook in early autumn, with greatest landings from August to December.

Marshall (1958) and Bruger (in prep.) found that snook may mature at less than 35 cm FL. Approximately 50% are mature at 40 cm FL, and virtually all are mature at 50 cm FL; according to Volpe (1959) and Bruger (in prep.), they are in their second and third years of life, respectively (Table 2).

Table 2. Calculated mean fork length of snook by age group (from Volpe 1959).

Age	Size (mm)
I	163
II	342
III	456
IV	563
V	660
VI	723
VII	782

Except for the usually short movement to spawning areas, snook are nonmigratory. In the Naples/Marco Island region, G. E. Bruger (Florida Department of Natural Resources, St. Petersburg, Florida; pers. comm.) tagged 5,493 snook from 1976 to 1981. Of the 1,257 returns received by May 1982, 68.8% had moved 5 mi or less from the tagging site, 18.5% moved 5-10 mi, 5.3% 10-15 mi, and 7.1% greater than 15 mi.

GROWTH CHARACTERISTICS

The largest snook reported for Florida on both the gulf and Atlantic coasts were 102 cm FL (Fore and Schmidt 1973; Marshall 1958). Length conversion factors are listed in Table 3.

Table 3. Length conversion formulas for juvenile snook in southwest Florida, based on 175 specimens 14 to 196 mm FL (Fore and Schmidt 1973).

Formula				
SL	=	-0.369 +	0.870	FL
FL	=	-0.424 +	1.150	SL
FL	=	-1.531 +	0.909	TL
TL	=	1.684 +	1.100	FL
SL	=	-0.577 +	0.789	TL
TL	=	0.732 +	1.268	SL

According to published information, snook have a life span of at least 7 years, with females attaining larger size than males (Marshall 1958). Length-weight

relations for populations of juveniles (Fore and Schmidt 1973) and adults (Marshall 1958) in southwest Florida, and for adults on the east coast (Gilmore et al. 1983) are illustrated in Figures 5 and 6.

The growth rate of snook in southwest Florida was illustrated by Volpe (1959), and in the Indian River by Gilmore et al. (1983) (Figures 7, 8). The growth rate of larval snook was determined in captivity and it may present an underestimation due to the difficulty associated with laboratory maintenance of the fish (Shafland and Koehl 1979). Juvenile snook grow about 1.0 mm per day, at least during warmer periods (Fore and Schmidt 1973), on both coasts of Florida (Gilmore et al. 1983). According to Volpe (1959), the rate of growth is

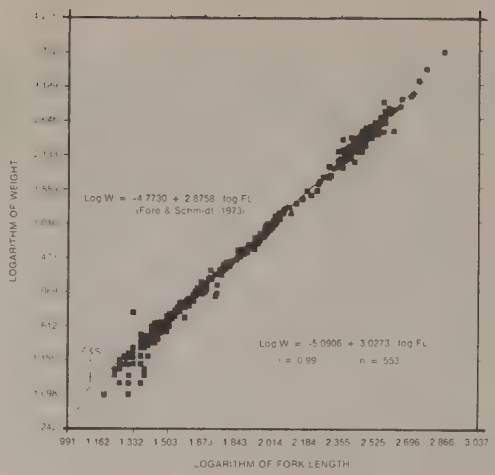

Figure 6. Length-weight relationship of juvenile snook, plotted by Gilmore et al. (1983) to illustrate their data from Indian River and those of Fore and Schmidt (1973) from Ten Thousand Islands. All points plotted are from Indian River specimens.

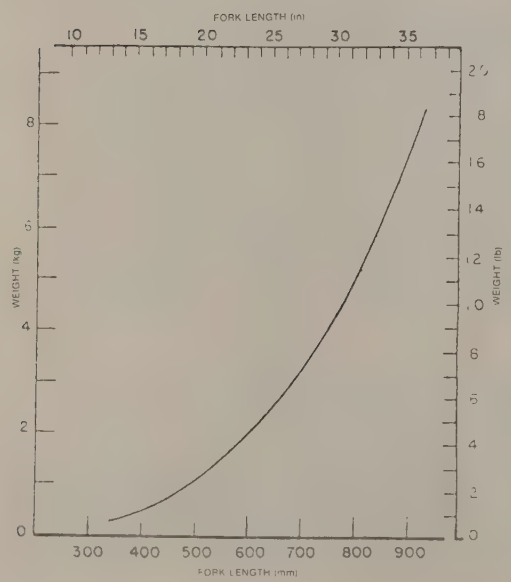

Figure 5. Length-weight relationship in C. undecimalis of the Ten Thousand Islands, Florida (from Marshall 1958).

relatively high to the second year of life, slower and fairly uniform to the fifth year, and thereafter slowly declines (Figure 7).

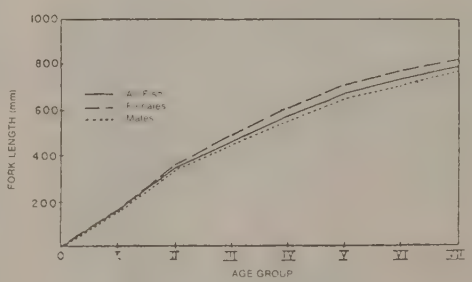

Figure 7. Growth curves showing average calculated fork length at end of each year of life for southwest Florida snook. All fish includes those for which sex was not determined (from Volpe 1959).

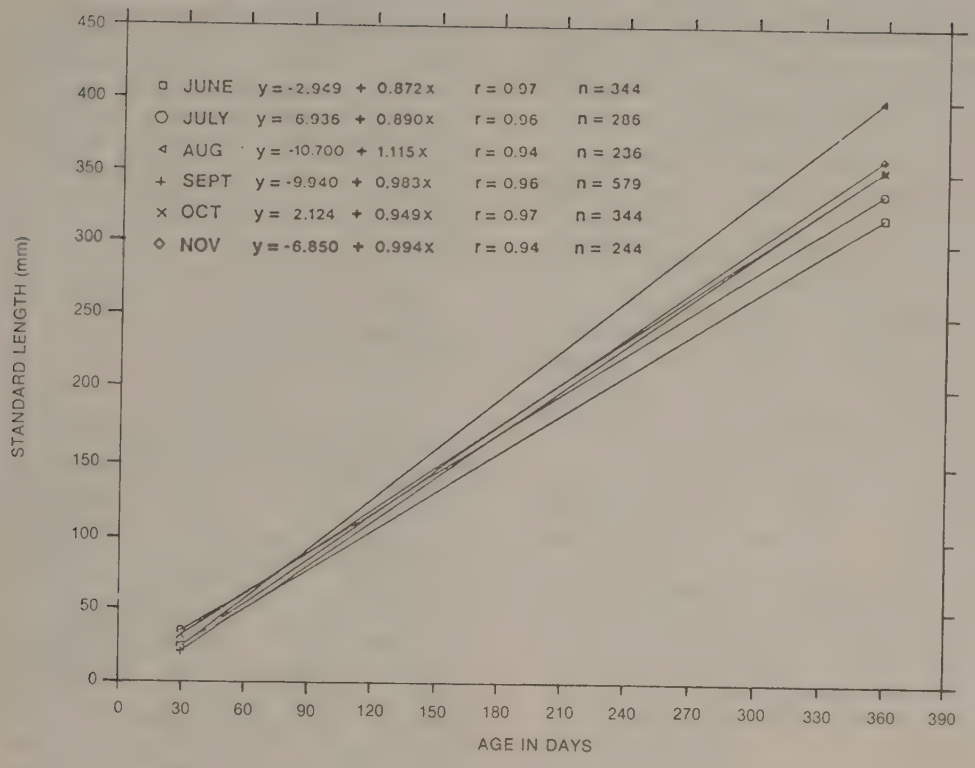

Figure 8. Calculated growth rates of Centropomus undecimalis based on length-frequency distribution (from Gilmore et al. 1983).

Volpe (1959) determined age of snook by using otoliths (Table 2); whereas scales were discounted for use, the sagitta was validated for accuracy. Comparative data (Bruger in prep.) on snook of uniform and slightly larger size reveal a maximum age of eight for snook taken in a Florida Department of Natural Resources study.

Coefficient of condition (K) was first calculated by Fore and Schmidt (1973) for juveniles, and subsequently applied by Gilmore et al.; both studies (Table 4) used the formula:

$$K_{FL} = \frac{W(10^5)}{L^3}$$

W: weight (g)

L: FL (fork length) (mm)

K values for snook collected at Ten Thousand Islands (gulf coast) from June through December were higher than those for Indian River (Atlantic coast) collections made in every month of the year. This discrepancy is partially a result of minimum K values in January and February, which reduced the mean for Indian River

snook (Gilmore et al. 1983). Other factors include different fish sampling techniques and times, and environmental and food differences. Seasonally adjusted data are more comparable between Atlantic and gulf coast locations (Table 4).

Table 4. Coefficient of condition (K) for juvenile snook from southern Florida.

Habitat	Values K	K range	Season
Freshwater[a]	0.93	0.24-1.36	12 months
Freshwater[a]	0.99	0.24-1.36	June-Dec.
Tidal stream[b]	1.05	0.77-1.52	June-Dec.
Marsh[a]	0.89	0.62-1.37	12 months
Seagrass[a]	0.96	0.52-1.82	12 months

[a]Gilmore et al. 1983.
[b]Fore and Schmidt 1973.

FISHERY

The south Florida snook fishery has been characterized by declining yields that led to closure of commercial harvest in 1957 and establishment of a closed summer sport season in 1982. It has never been one of the State's larger fisheries, yet it is and has been of economic importance locally. The status of the recreational fishery is reflected in the 1982 Final Report of the Florida Saltwater Fisheries Study and Advisory Council, which concluded that "the best information available indicates a serious problem in the fishery."

Commercial Harvest

The snook commercial fishery was relatively short-lived. Marshall's 1958 historical account indicates that market demand increased only after 1930, and peaked in response to World War II food shortages. Snook were taken both by efforts directed toward them and incidental to other fisheries. Hook-and-line, snook seines (later banned), the snook gill net, and other gear such as mullet trammel nets and gill nets were used. Production was concentrated in warmer months (Marshall 1958) in brackish and salt waters.

In the mid-1950's a decline of snook populations was perceived by conservation groups and attributed by them largely to commercial exploitation (Volpe 1959). Legislative efforts over a few years culminated in passage of a bill prohibiting sale of snook in the State of Florida and setting a daily bag limit of four fish per fisherman. Catch of snook from 1941 through 1955 showed a maximum catch in 1948 of 800,698 lb (Marshall 1958). In all but one of the years reported, west coast landings exceeded those on the east coast, usually by a factor of two. For 1955, the value to the fishermen of 451,661 lb was $63,233 (Marshall 1958).

For this same period there were no direct assessments of sport fishing harvest. However, incidental to a study of movement in 1956, Volpe (1958) used tag returns to partition commercial and recreational efforts. For the two leading production areas, Collier and Lee Counties, he estimated that sport exploitation accounted for 45% of the total snook harvest.

Limitations of the available production data were noted by Marshall (1958), who questioned their reliability as indicators of actual fish abundance. Marshall identified possible causes for declines in landings, including use of the seine, market decline, and reduced availability of snook. It was not possible, however, to calculate catch-effort statistics based on the fisheries production records available.

It is important to elaborate on the role of habitat as a factor in snook availability for fishery exploitation. Sensitivity to low temperatures (Volpe 1959) is discussed in the habitat section of this paper. The following environmental alterations were hypothesized by Marshall (1958) to be of more importance than fishing in the decline of C. undecimalis in the 1950's: reduced freshwater discharge into south Florida estuaries; sewage and industrial pollution; dredging and filling; mosquito control practices including ditching and draining marshes, and insecticides. Marshall concluded that even with no fishing pressure, the snook population would have declined.

Sport Fishing

Since 1957, when legislation made it illegal to buy or sell snook, harvest has been limited to recreational angling. Nonetheless, pressures on the fishery stock continued, and in 1982 emergency authority was granted to the Florida Department of Natural Resources (FDNR) to prohibit taking and possessing snook between June 1 and July 31, 1982 (Sport Fishing Institute [SFI] 1982). The SFI (1982) note also documented the FDNR concern that "collapse of the snook fishery is likely to result" without a prohibition of fishing during the spawning season, and cited FDNR population estimates of mature fish in the gulf coastal area of Naples for 1977 (28,000 fish) and 1981 (8,600 fish).

The FDNR study of angling in the Naples/Marco Island area found that 45% of the annual snook catch was made in the period June 1-July 31 (Florida Saltwater Fisheries Study and Advisory Council 1982; Bruger in prep.). This is a time of local spawning movement. Furthermore, tagging in 1981 revealed recruitment failure due to a poor spawning year in 1978. This compounded the pressure on snook from low temperatures and environmental pollution (SFI 1982).

Tagging (Bruger 1981) in this area since 1976 indicates a small, heavily exploited subpopulation of snook (Bruger 1980). Data from this project are under analysis but not yet published, so that further discussion of population dynamics is not yet possible.

Fishery Management and Restoration

Fishery systems are composed of three elements that may be managed individually or in concert: habitat, biota, and fishing. Although State and local governments are sensitive to issues concerning habitat restoration or protection, the many aquatic resource laws and policies in Florida are not targeted exclusively to snook population conservation. A multiple-use philosophy applies to management of resources. However,

conservation of coastal fresh and brackish waters will directly benefit snook.

Manipulation of the biology of Centropomus undecimalis has been addressed by Florida Game and Fresh Water Fish Commission research on fish culture. A principal motivation for a series of experiments on propagation and rearing of snook was the suggestion of stocking them in freshwater in south Florida. Shafland and Koehl (1979) raised the possibility that snook fisheries might be reestablished as a recreational resource while also increasing predation on less desirable exotic and roughfish species overcrowding many areas. In mid-1982, public interest in saltwater stocking in the Miami area was expressed. Results of a long-term culture study, including review of limitations to fingerling production, are presented by Chapman et al. (1982).

Management of fishery effort has been discussed previously. The Florida Saltwater Fisheries Study and Advisory Council (1982) recommended that the June-July closed angling season be in effect for 5 years, during which time monitoring studies would be conducted. More recently, FDNR established an Emergency Fishing Ban that prohibited taking snook of any size during January-February 1983.

ECOLOGICAL ROLE

Snook are opportunistic carnivores. They tend to be piscivorous, with their specific diet varying according to the habitat in which they reside. In east coast freshwaters, juveniles prey upon microcrustaceans, palaemonid shrimp, and especially neonatal mosquitofish (Gambusia affinis). The diet of salt-marsh juveniles is similar, with the addition of sheepshead minnow (Cyprinodon variegatus). In the seagrass habitat snook prey principally on fish, primarily anchovy (Anchoa mitchilli) and pinfish (Lagodon rhomboides), and on penaeid shrimp (Gilmore et al. 1983). Harrington and Harrington (1961) collected juvenile snook in the same general areas, but found that at 15 mm FL the diet was made up of 10% fish with the other 90% consisting primarily of copepods. By 25 mm FL these two percentages were essentially reversed, and at 35-45 mm FL the proportion of fish in the diet remained high, but copepods were replaced by palaemonid shrimp.

On Florida's west coast fishes were also the major prey item (80.8% by volume) of juvenile snook, with sailfin molly (Poecilia latipinna) the most numerous species. Shrimps are next in importance volumetrically, followed by portunid crabs, insects, and microcrustaceans (Fore and Schmidt 1973). All juveniles from 14 to 196 mm FL were apparently lumped together for this diet study.

In two studies of larger snook, Marshall (1958) and Fore and Schmidt (1973) agreed that the adult diet consists mainly of fish and crustaceans, but they differed on the proportions of the various components. Marshall (1958) identified seven species of fishes, two of which (striped mullet [Mugil cephalus] and pigfish [Orthopristis chrysoptera]) were not found by Fore and Schmidt (1973), who identified 11 species. The former study reported fish as making up 86.4% by volume of the adult diet and the latter 55.1%.

The two studies were also not in agreement on the importance of crustaceans, especially crabs, in the diet of adult snook. Marshall (1958) found that crabs represented only 4.4% by volume of the diet, while Fore and Schmidt (1973) reported 32.3% by volume.

The wide range of prey of adult snook is attributable to the wide range of salinities in which snook are found (Marshall 1958). Fore and Schmidt (1973) concluded that the preponderance of food organisms was associated either partially or entirely with the water column. Strictly benthic organisms and bottom debris, normally found in the stomachs of benthic feeding fishes, occurred only rarely in snook, indicating that the snook is a pelagic feeder. Although the diet of snook overlaps that of many fishes, no evidence for the existence of competition has been reported. No published account of important predators on snook was found.

ENVIRONMENTAL REQUIREMENTS

Temperature

Nearly all references to snook that discuss their distribution consider low water temperature as a major limiting factor. Storey and Gudger (1936) observed that during the winter of 1917 when air temperatures dipped below freezing at Sanibel Island, Florida, snook were so lethargic that fishermen landed hundreds of pounds per boat using dip nets. Storey and Gudger (1936) and Marshall (1958) agreed that a low mean monthly water temperature of 15.6°C limited the range of snook in Florida. More recent information on cold water influence is presented by Chamberlin and Armstrong (1977).

Although young snook have been recorded from as far north as New York (Schaefer 1972), low water temperatures generally prevent the establishment of permanent populations north of Florida. Linton and Rickards (1965) collected young-of-the-year snook in Georgia continually for 6 months until the water temperature dropped to 18°C in late November, after which no more were caught. In an experimental study of temperature effects, Shafland and Foote (in review) found that 4-month-old snook died at water temperatures of 12°-14°C.

Salinity

As noted, adult snook occur in a wide range of salinities, from 0 ppt to full-strength seawater. Snook are unable to spawn in freshwater, however, since their sperm is activated only by saltwater (L. A. Ager, Florida Game and Fresh Water Fish Commission, pers. comm. as cited by Shafland and Koehl 1979). Larvae and juveniles are apparently capable of surviving the same salinity range as adults since Shafland and Koehl (1979) successfully converted 15-day-old snook from seawater (35 ppt) to freshwater.

Habitat

The conspicuous and nearly constant feature of the snook's habitat in Florida is the presence of mangroves (Marshall 1958). The distribution of mangroves throughout the State closely parallels that of snook, and the larger areas of mangroves typically coincide with maximum snook production. Austin (1971) likewise concluded that the presence of snook was characteristic of both high and low salinity mangrove estuaries in Puerto Rico.

There has been an extensive reduction of mangrove swamp, especially along Florida's southeast coast. Adult snook are still found in a variety of other habitats (Figure 4) including nearshore reefs, sandy beaches, jetties, and other shorelines in fresh-, brackish, and marine waters (Gilmore et al. 1983); however, larval and juvenile snook have been found only in a restricted range of habitat types (see Life History). During these life stages, when snook are most subject to predation and metabolic requirements are high, the availability of proper habitats is apparently critical (Gilmore et al. 1983). The necessity of maintaining habitat to sustain populations of snook was reiterated at a Snook Symposium held November 20, 1982, co-sponsored by FDNR and the International Game Fish Association.

Other Environmental Factors

Although no studies of the oxygen requirements of adult snook were found, Shafland and Koehl (1979) reported that juveniles survived overnight minimum dissolved oxygen concentrations of 0.4 ppm in small grow-out ponds. No thorough study of the parasite fauna of snook has been reported, despite the fact that Marshall (1958) found a prevalence of 70% for an unidentified nematode in the mesenteries and stomach wall and an intensity of up to hundreds of worms per fish. Other parasites reported from snook include Philometra centropomi (Nematoda) in the nasal mucosa (Caballero 1974) and Prosthenhystera obesa (Trematoda) in the gall bladder (Caballero and Jimenez 1967), both from Mexican waters. Howse (1972) reported snook as a new host for Lymphocystis virus.

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William Seaman, Jr., and Mark Collins

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Sea Grant and School of Forest Resources and Conservation, and
Department of Zoology
University of Florida
Gainesville, FL 32611

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National Coastal Ecosystems Team
Fish and Wildlife Service
U.S. Department of the Interior
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U.S. Army Corps of Engineers
Waterways Experiment Station
P.O. Box 631
Vicksburg, MS 39180

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16. Abstract (Limit: 200 words)

Species profiles are literature summaries on the taxonomy, morphology, range, life history, and environmental requirements of coastal finfishes and shellfishes. They are designed to assist in environmental impact assessment. The snook (Centropomus undecimalis) is of regional importance in the recreational fishery of south Florida, where its abundance centers in mangrove-fringed coastal waters. Commercial fishing is no longer allowed, and closed sport seasons have been enacted recently. Serious population declines have been caused by degradation of habitat and fishing pressure. Snook exhibit a classic estuarine-dependent life cycle, with spawning in nearshore salt waters in warmer months and juvenile development in brackish inshore tidal streams, salt marshes, and grass beds. Juveniles remain in estuaries for the first year of life, whereas adults range from freshwater to oceanic habitats. Snook are carnivorous, non-migratory except for localized spawning-associated movements, and typically achieve sexual maturity in the second and third years of life (at 40-50 cm fork length). This species is susceptible to cold, with 15.6°C regarded as a lower limiting temperature.

17. Document Analysis a. Descriptors

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Regional Director
U.S. Fish and Wildlife Service
Lloyd Five Hundred Building, Suite 1692
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Portland, Oregon 97232

REGION 2
Regional Director
U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, New Mexico 87103

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Regional Director
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Richard B. Russell Building
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U.S. Fish and Wildlife Service
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Denver, Colorado 80225

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